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(73) Proprietor: The Vendo Company
7209 North Ingram Avenue
Fresno
California 93650 (US)

(72) Inventor: Chidders, Spencer L.
7549 E. Clinton Avenue
Fresno
California 93727 (US)

(74) Representative: Ballilie, Iain Cameron et al
c/o Ladas & Parry
Althelmer Eck 2
D-80331 München (DE)

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Description**1. Field of the Invention**

The present invention relates to a fastening apparatus and more particularly to a fastening apparatus adapted for use in a wide variety of operational environments and operable to achieve a rapid and dependable interconnection of a pair of work objects while simultaneously affording the capability for fine adjustment of the work objects relative to each other, the fastening apparatus having particular utility in the closing and sealing of the main doors of vending machines and the like, according to the precharacterising portion of claim 1 (DE-B-1 188 378).

2. Background of the Invention

There are many situations in which a pair of work objects must be dependably and precisely secured relative to each other and where the speed with which this can be achieved is of operational significance. One such environment in which these observations apply is in the case of the stocking and servicing of vending machines and the like.

Vending machines, by their very nature, must be locked to prevent unauthorized entry and, where the vendable contents are refrigerated, must be sealed to insure that the desired refrigerated environment can be maintained. Thus, in the case of machines for vending soft drinks in metal containers and/or plastic or glass bottles, the main closure or door on the vending machine must be sealed and locked during normal use.

There are, of course, times when the interior compartment of a vending machine must be accessed by authorized personnel. The closure must be opened to check and, as necessary, to replenish the contents of each column of vendables within the vending machine. The money paid into the machine must periodically be collected. The change mechanism within the machine may need to be serviced. The machine may need to be opened if it becomes jammed, or the machine may simply need to be serviced.

Common practice in the operation of vending machines calls for them to be restocked and the income collected from the coin boxes thereof at relatively frequent intervals. The length of the interval depends upon the commercial history of the particular machine involved. In any case, the personnel authorized to open such vending machines are typically on tight schedules servicing a great number of vending machines at widely dispersed locations. Accordingly, such personnel are often disinclined to pay close attention to details not specifically required by their primary responsibil-

ties in servicing the vending machines.

In their hurry to finish with one vending machine and move on to the next, proper attention is often not paid to insuring that the main door of the vending machine is fully closed and sealed. Where a proper seal of the door is not achieved, the necessary refrigerated environment may be difficult or impossible to maintain. External heat may enter the interior of the vending machine at a rate which may require the refrigeration unit to run inordinate periods of time causing wear to the unit and wasting electrical energy. Improper sealing allows warm air to enter and form moisture by condensation which eventually finds its way to the evaporator coil of the refrigeration system. This may cause the coil to be clogged by ice as excessive water collects, thus blocking air flow. This prevents cooling of vendables in the machine. In other instances, it may be impossible for the refrigeration unit to maintain the desired temperature. In such instances the vendables may not be sufficiently cold to be appealing to customers leading to a loss of sales. In the most aggravated cases, of course, certain vendables may be damaged by a lack of adequate refrigeration.

The likelihood that a proper seal will not be achieved is increased by the fact that in order to accomplish a proper seal, the securing mechanism must be rotated a substantial number of times. Such securing mechanisms conventionally employed consist of a screw threaded bolt which is threaded into an internally screw threaded nut or the like. Because the sealing material itself is typically a rather substantial rib of synthetic rubber material running entirely around the opening which the door covers, considerable force must be applied in compressing the rib to the degree necessary to accomplish the desired seal. This can, as a practical matter, be best achieved through the mechanical advantage obtained through the use of a screw threaded bolt. The bolt, thus, must be turned in a number of complete revolutions to achieve the proper compression and seal. The bolt type lock system has also been shown to provide a high degree of security against vandalism and break in. Yet it is simple and of relatively low cost compared to other locking systems known to the art.

As a consequence, servicing personnel frequently turn the securing bolt only the number of turns necessary to place the rib of the door in contact with the housing of the vending machine and not the additional number of rotations required to compress the rib enough to achieve the optimum seal. The unsatisfactory consequences of this failure previously set forth are too often the result.

Therefore, it has long been known that it would be desirable to have a fastening apparatus having application to the rapid and dependable intercon-

nexion of work objects of a variety of types having particular utility in the closing and sealing of the main doors of vending machines and the like which affords the mechanical advantage necessary to achieve the optimum seal, but which can be operated in a small fraction of the time and with a small fraction of the amount of effort required by conventional fastening mechanisms; which assists in assuring that the doors of vending machines when closed are sealed in the optimum manner; which minimizes the amount of waste of electrical energy, wear of equipment and damage or inadequate refrigeration of vendables attendant to conventional operations; and which is durable, dependable and fully capable of operating as otherwise required.

A prior art that is of interest is that disclosed in DE-B-1 188 378 concerning a quick action closing device. The accompanying Claim 1 has been divided into a two-part form based on the assumption that this document is the nearest state of the art.

SUMMARY OF THE INVENTION

The invention provides a fastening apparatus which preferably can be operated rapidly and dependably to secure a pair of work objects to each other. The apparatus may be adaptable for use in a wide variety of operative environments achieving all of the operative benefits attendant thereto, and may be particularly well suited to securing and sealing the main closures of vending machines and the like wherein mechanical advantage must be achieved in drawing the closure into a fully sealed condition relative to the vending machine. Conveniently, force in an axial direction applied in closing the closure is received by the fastening apparatus in such a manner as to accelerate the sealing operation.

The apparatus conveniently substantially reduces the amount of time and effort required for service personnel to close and seal vending machines and the like thereby substantially increasing the likelihood that such service personnel will properly close and seal such machines. The apparatus may operate to insure that waste of electrical energy, wearing of components and loss of sales or product damage resulting from inadequate refrigeration of the vendables is minimized in the operation of vending machines.

Preferably, the fastening apparatus assures a high degree of security found with other conventional bolt type closures, and possesses all of the mechanical advantage obtained in a screw threaded fastening assembly while possessing the advantages attendant to the operation of a quick lock type of fastening assembly.

According to one aspect of the invention, there is provided a fastening apparatus operable to secure a pair of work objects to each other, the fastening apparatus comprising an engagement member having a longitudinal axis and adapted to be mounted on one work object for substantially rotational movement about the longitudinal axis; mounting means; a housing mounted on the mounting means, the housing having an opening and an internal chamber within the housing, the chamber being bounded by a cam surface convergent in the direction of the opening; at least two grasping segments received in the chamber of the housing, the segments being positionable in a first position with the segments transversely forming a closed substantially circular configuration and defining a passage therethrough in substantial alignment with the opening of the housing; a spring in the housing in engagement with the segments characterized in that the spring is a compression spring in the housing and resiliently retains the segments in the first position whereby when the one work object is moved to a closed position, the engagement member passes through the opening and into the passage formed by the segments in the first position to force the segments inwardly of the housing from the first position and from each other along the cam surface to penetrate the passage, the compression spring urging the grasping segments into engagement with the engagement member, and the housing further comprises a backwall having a lip extending inwardly of the housing, the lip and backwall extending inwardly of the housing internally of the spring to retain the spring in position within the housing.

In another aspect of the invention, there is provided a fastening apparatus operable to secure a pair of work objects to each other and wherein one of the work objects mounts an engagement member deployed for interlocking the work objects in a conventional configuration, the fastening apparatus comprising a mount adapted for attachment on the other of the work objects in substantially a predetermined position; and a grasping assembly borne by the mount and operable to expand upon movement of said engagement member therewithin and subsequently to contract for engagement with the engagement member to interlock the work objects.

According to another aspect of the invention, there is provided a fastening apparatus operable releasably to secure first and second work objects together, the fastening apparatus comprising: a member adapted to be mounted on the first object extending outwardly therefrom and having a distal end portion inscribed by screw threads; a housing adapted to be mounted on the second work object substantially in a predetermined position and hav-

ing an opening communicating with a chamber internally of the housing; at least two grasping members mounted in the chamber of the housing for movement between proximal first positions and spaced second positions; means for resiliently urging the grasping members into the first positions; and means borne by the grasping members for engaging the screw threads of the member in the first position, whereby the work objects can be moved together to drive the member through the opening in the housing and into contact with the grasping members to move the grasping members toward the spaced second positions to admit the distal end portion of the member therebetween and the urging means resiliently urges the grasping members toward the first positions whereby the engagement means engage the screw threads on the distal end portion of the member to secure the first and second work objects together.

DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective exploded view of the grasping assembly of the fastening apparatus of the present invention.

Fig. 2 is a fragmentary horizontal section of a portion of a closure and case of a vending machine mounting the fastening apparatus of the present invention.

Fig. 3A is a somewhat enlarged, longitudinal vertical section taken from a position indicated by line 3-3 in Fig. 2 and fragmentarily showing the securing bolt aligned with and spaced from the grasping assembly of the fastening apparatus.

Fig. 3B is a somewhat enlarged, longitudinal vertical section taken from a position indicated by line 3-3 in Fig. 2 and fragmentarily showing the securing bolt during movement into the grasping assembly driving the grasping segments farther inwardly of the grasping assembly and from each other.

Fig. 3C is a somewhat enlarged, longitudinal vertical section taken from a position indicated by line 3-3 in Fig. 2 and fragmentarily showing the securing bolt fully engaged by the grasping assembly with the grasping segments engaging the screw threads thereof.

Fig. 4 is a somewhat enlarged, transverse vertical section taken from a position indicated by line 4-4 in Fig. 2 and showing the securing bolt fully engaged by the grasping assembly.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring with greater particularity to the drawings, the fastening apparatus of the present invention is generally indicated by the numeral 10 in Fig.

2. The fastening apparatus is shown in Fig. 2 in a representative operative environment mounted on a vending machine 20. As will become more clearly apparent, the fastening apparatus of the present invention can be employed in a wide variety of operative environments where two work objects are to be secured to each other. The vending machine 20 is merely representative of one such operative environment.

The vending machine 20 is shown fragmentarily in Fig. 2 in horizontal section and has a closure or door 21 and a case or housing 22. The door has an outer shell 23 with a face or front wall 24 and a side wall 25 which extends about the perimeter of the door. The front wall has a recess 26 in a predetermined location which communicates with a passage 27. The side wall of the outer shell bounds an opening 28 extending over substantially the entire back surface of the door 21. A stop 29 is mounted on the side wall 25 within the outer shell 23 extending entirely about the interior of the door. A seal 30 of resilient material is affixed on the stop also extending entirely about the interior of the door.

The door 21 mounts an inner door 31 which, by means not shown, moves with the door 21, but can be pivoted to and from the seal 30 and through the opening 28 when desired if the door 21 is open. The inner door 31 has a perimeter portion 32 and mounts a main rib or seal 33 extending entirely about the perimeter portion of the inner door and so positioned as to extend through the opening 28 defined by the side wall 25 of the outer shell 23. A bore 34 extends through the inner door 31 in a predetermined position. The outer shell 23 and inner door 31, when the inner door is in the closed position shown in Fig. 2, define an interior compartment for the door 21.

The housing 22 of the vending machine 20 has a side wall 40 having an interior surface 41 and an exterior surface 42. The side wall 40 has a front surface 43. The housing 22 has a floor 44. The side wall, floor and other walls of the housing define a front opening 45 for the housing communicating with an interior 46 thereof.

An engagement or securing bolt assembly is generally indicated by the numeral 60 in Fig. 2. In order to operate, the fastening apparatus 10 of the present invention requires the use of a member to grasp. However, the structure of the member with which the grasping assembly can operate can vary substantially. In the operative environment of the vending machine 20 shown in Fig. 2, a conventional securing bolt assembly typical of those used in vending machines is shown. The securing bolt assembly has a lock assembly 61 of conventional construction including a head portion 62 mounted in the recess 26 of the door 21 and a barrel portion

63 which extends through the passage 27 and into the interior compartment 35. The lock assembly has a handle portion 64 slidably received in the barrel portion and consisting of a shaft 65 and a key receiving portion 66.

The securing bolt assembly 60 has an engagement member or securing bolt 70 having a longitudinal axis 71. The securing bolt has a distal end portion 72 and an opposite proximal end portion 73 which is mounted for rotational movement in the barrel portion 63 of the lock assembly. The shaft 65 of the handle portion of the lock assembly is slidable relative to the securing bolt by a spline interconnection, not shown. Standard male screw threads 74 are inscribed about the distal end portion 72. The distal end portion mounts a tapered probe 75.

The lock assembly 61, of conventional construction, operates in the conventional manner. The operator inserts the appropriate key into the key receiving portion 66 and turns it to release the handle portion. The handle portion is moved out of the lock assembly by operation of an internal compression spring, not shown, a sufficient distance so that the handle portion 64 can be grasped by the operator. Such outward movement of the handle portion so interconnects the shaft 65 and the securing bolt through operation of the spline, not shown, that turning of the handle rotates the securing bolt about the longitudinal axis 71. Conversely, when the handle portion is pushed into the lock assembly to the position shown in Fig. 2, it again locks in place and turning of the handle portion no longer achieves rotation of the securing bolt.

A flange 76 is mounted in fixed relation on the securing bolt in the predetermined position shown in Fig. 2. A washer 77 is received rotationally about the securing bolt against the barrel portion 63 of the lock assembly 61. A compression spring 78 is captured between the washer and the flange which simply serves to cushion any impact encountered by the securing bolt such as in opening and closing the door 21 or inner door 31.

The fastening apparatus 10 has a mount or bracket 80 adapted to be mounted on the interior surface 41 of the side wall 40 of the housing 22. As best shown in Figs. 3A, 3B, 3C and 4, the side wall 40 has four internally screw threaded bores 81 extending into the side wall in predetermined locations. The bracket has a substantially flat face plate 82 having four bolt holes 83 extending therethrough in positions corresponding to the positions of the screw threaded bores 81. The bracket has a substantially flat mounting plate 84 mounted thereon substantially at right angles thereto, as best shown in Fig. 2. The mounting plate has two oversize holes 85 extending therethrough in predetermined spaced positions. A control passage 86 extends

through the mounting plate between the oversize holes 85.

The bracket 80 is mounted on the interior surface 41 of the side wall 40 by four bolts 87 individually extending through the bolt holes 83 of the face plate 82 and screw threadably secured in the screw threaded bores 81. The bracket is thus mounted in the attitude and position shown in Fig. 2.

The fastening apparatus 10 has a grasping assembly 90 shown in exploded perspective view in Fig. 1. The grasping assembly has a housing 91 with laterally extending flanges 92. The housing and the lateral flanges thereof have a substantially flat front surface 93 from which a pair of substantially cylindrical bosses 94 are extended in positions adapted to mate with the oversize holes 85 in the mounting plate 84 of the bracket 80. The bosses have internally screw threaded bores 95. The housing is mounted on the mounting plate with the bosses 94 individually extended through the oversize holes 85 with the flat front surface 93 in facing engagement with the mounting plate. The length of the bosses is such that the terminal ends 96 thereof extend just beyond the opposite surface of the mounting plate. The external diameter of the bosses is smaller than the internal diameters of the oversize holes so that the bosses, and therefore the housing, is permitted limited movement laterally on the mounting plate a full 360 degrees.

The housing 91 and bosses 94 are retained in the described positions by washers 97, having external diameters greater than the interior diameters of the oversize holes 85, and are retained on the terminal ends of the bosses by screws 98 individually extending through the washers and screw threadably secured in the screw threaded bores 95. Thus, because of the greater length of the bosses relative to the thickness of the mounting plate 84 and the smaller diameters of the bosses relative to the oversize holes, the grasping assembly can move laterally on the mounting plate to a degree limited by the "play" thereby afforded.

The housing 91 has a longitudinal axis 99. The housing has a contact surface or mouth 110 of a substantially frustoconical configuration communicating with the central passage 86 of the mounting plate 84. The "play" permitted by the bosses 94 and oversize holes 85 previously described is such that communication between the central passage 86 and the mouth 110 is maintained. The mouth converges upon an opening 112 which in turn communicates with a chamber 113, as can best be seen in Figs. 3A, 3B and 3C. The chamber is defined by a substantially frustoconical or cam surface 114 having three guide slots 115 therein. As can best be seen in Fig. 4, the guide slots are spaced from each other substantially 120 degrees.

about the longitudinal axis 99 of the housing. As best shown in Figs. 3A, 3B and 3C, the guide slots extend from a proximal wall 116 adjacent to the opening 112 to a terminal edge 117 of the chamber 113.

Mounted within the housing 91 of the grasping assembly 90 is female assembly 120 composed of three grasping members or segments 121. As will subsequently be described, the female assembly is adapted for movement within the chamber of the housing and the grasping segments composing the female assembly are adapted for controlled movement relative to each other.

When the female assembly 120 and the grasping segments 121 thereof are in the position shown in Figs. 3A and 3C, the female assembly may be viewed as having a front surface 122 and an opposite rear surface 123. Similarly, the female assembly has a substantially frustoconical outer surface 124 which, in the position shown in Figs. 3A and 3C, is disposed in substantially facing relation with the frustoconical surface 114 of the housing. Three ridges 125 are mounted on and extend outwardly from the outer surface 124. The ridges are spaced 120 degrees from each other about the outer surface and are individually received in sliding relation in the guide slots 115 of the cam surface 114. As can best be seen in Fig. 4, one of the ridges extends outwardly from each of the grasping segments. Each of the ridges has a leading end 126 and an opposite trailing end 127.

The female assembly 120, in the positions shown in Figs. 3A and 3C, has a frustoconical strike surface 128 extending convergently inwardly from the front surface 122 and communicating with a passage 129 substantially concentric to the longitudinal axis 99 of the housing and bounded by female screw threads 130.

The female assembly 120, received in the housing 91 as described, is adapted for movement between a first position 131, which is the position shown in Figs. 3A and 3C, and a second position, not shown, wherein the trailing ends 127 of the ridges 125 and the rear surface 123 of the female assembly are immediately adjacent to the terminal edge 117 of the housing 91. Each of the grasping segments 121 has lateral shoulder portions 133 which, in the first position 131 of the female assembly, individually facingly engage the lateral shoulder portions of adjacent grasping segments.

The housing 91 has a pair of screw threaded bores 140 extending inwardly of the housing from the terminal edge 117 on opposite sides of the chamber 113 as can best be seen in Fig. 1. A removable closure 141 is mounted on the terminal edge of the housing. The closure has a lateral flange 142 having a pair of bolt holes 143 extended therethrough in positions matching the positions of

the screw threaded bores 140. The closure is mounted on the housing by bolts 144 individually extending through the bolt holes 143 and screw threadably secured in the screw threaded bores.

5 The closure has a cylindrical portion 145 having a backwall 146. The backwall has an opening 147 therein communicating with the interior of the housing and bounded by an inwardly directed interior lip 148.

10 A compression spring 149 is positioned in the housing 91 captured between the backwall 146 of the closure 141 and extending about the lip 148 and the rear surface 123 of the female assembly 120. The strength of the compression spring is such as resiliently to retain the grasping segments 121 and thus the female assembly 120 in the first position 131 shown in Figs. 3A and 3C. The compression spring operates in most instances to prevent the female assembly, in being moved from the first position during operation of the fastening apparatus 10, from reaching the second position. More commonly, the maximum distance of movement of the female assembly from the first position is the intermediate position 150 shown in Fig. 3B. This, of course, depends upon the amount of force applied by the operator.

OPERATION

The operation of the described embodiment of the subject invention is believed to be clearly apparent and is briefly summarized at this point.

A vending machine 20, mounting the fastening apparatus 10 of the present invention, may require opening for a variety of reasons. The most common reason for opening the vending machine, of course, is to check the quantities of vendables in each column in the vending machine and to replenish those columns requiring such restocking. However, there are many other reasons for opening vending machines such as servicing, repair, collecting from the coin box and the like.

Where such opening is required, the person seeking entry must have the required key in order to operate the lock assembly 61. As previously described, the key is inserted into the key receiving portion 66 of the lock assembly and turned to release the handle portion 64 for grasping by the operator. The securing bolt 70 is at this time screw threadably received in the grasping assembly 90 substantially as shown in Fig. 3C. Turning of the handle portion in a counterclockwise direction rotates the securing bolt, similarly, in a counterclockwise direction about its longitudinal axis 71. The rebounding from compression of the main seal 33 and the weight of the door, without more, causes some outward pull on the securing bolt and thus keeps the threads engaged in such a manner.

as to allow continued unthreading. In those operative environments where there is no seal and the weight of the door may not be very great, such as in non-insulated cabinets, slight outward pulling on the handle portion will accomplish the same purpose.

Such turning of the handle portion 64 is continued until the male screw threads 74 of the securing bolt completely unthread themselves from the female screw threads 130 of the female assembly 120. The female assembly 120 stays in the first position 131 as shown in Fig. 3C unless the operator were to push the door and thus the securing bolt back inwardly of the grasping assembly 90.

When unthreading of the securing bolt 70 from the female assembly 120 has been achieved, the door 21 is simply pulled open from the housing 22 withdrawing the securing bolt 70 from the grasping assembly 90. If entry to the interior compartment 35 between the outer shell 23 and the inner door 31 is required, the inner door is simply pivoted away from the main seal 30 thus withdrawing the inner door from about the securing bolt. This exposes the interior compartment. In any case, the operator at this time performs whatever tasks required opening of the vending machine.

When these tasks have been completed and it is again time to close, seal and lock the door 21 in the closed position, the operator simply moves the door into the closed position shown in Fig. 2. While normally this will be done with moderate force, the door could literally be slammed shut by the operator. The fastening apparatus 10 works with equal dependability in either case.

As the door 21 is moved to the closed position, the distal end portion 72 of the securing bolt 70 approaches the grasping assembly 90 as shown in Fig. 3A. For illustrative convenience, the securing bolt and the grasping assembly are shown as precisely aligned in Fig. 3A. Thus, as shown therein, the longitudinal axis 71 of the securing bolt is coincident with the longitudinal axis 99 of the housing 91. However, as previously discussed, the grasping assembly 90 can move laterally to a limited extent on the mounting plate 84. Thus, the longitudinal axes of the securing bolt and the housing 91 may not, and need not, be precisely aligned as the securing bolt enters the grasping assembly. Initial contact between the distal end portion 72 of the securing bolt and the grasping assembly automatically causes the grasping assembly to be moved laterally to the extent necessary to place the longitudinal axis of the housing in coincidence with the longitudinal axis of the securing bolt. Since, depending upon the particular structure mounting the securing bolt, the distal end portion 72 of the securing bolt may be laterally movable to a limited degree, the alignment of the grasping

assembly and the securing bolt may involve some lateral adjustment of each.

Referring again to Fig. 3A, the distal end portion 72 of the securing bolt 70 passes through the central passage 86 of the mounting plate 84, the mouth 110 of the housing 91, the opening 112 of the housing and into the passage 129 of the female assembly 120. During such movement, the tapered probe 75 or the male screw threads 74 may contact the mouth 110, opening 112 and/or the strike surface 128. When this occurs, the lateral adjustment of the grasping assembly and the securing bolt previously described takes place to position the longitudinal axis 71 of the securing bolt 70 in coincidence with the longitudinal axis 99 of the grasping assembly. Similarly, the contact of the male screw threads 74 with the female screw threads 130 achieves such alignment.

Since the male screw threads 74 are dimensioned screw threadably to engage the female screw threads 130 when the female assembly 120 is in the first position 131, even where the securing bolt 70 and grasping assembly 90 are precisely aligned prior to any contact between the two, the respective screw threads contact each other. Accordingly, there is always contact by the distal end portion 72 of the securing bolt with the female assembly 120 as the securing bolt moves into the grasping assembly. This causes not only the alignment of the two as previously described, but also causes the grasping segments 121 comprising the female assembly to be driven from the first position inwardly of the chamber 113 and from each other as permitted by the cam surface 114. The ridges 125 slide during such movement in the guide slots 115 thereby preventing them from rotating during bolt rotation and insuring that the grasping segments do not become jammed. The compression spring 149 allows the grasping segments to move from the first position only so far as required to admit the male screw threads fully within the passage 129. Movement of the grasping segments from each other and from the first position is illustrated in Fig. 3B. The greater the force applied in closing the door 21 or the longer the force is applied in closing the door, the farther the male screw threads of the securing bolt will be received in the passage 129. Since the objective in use of the fastening apparatus 10 of the present invention is to achieve dependable and secure sealing of the door 21 on the housing 22 of the vending machine 20 as quickly as possible, moderately forceful closing of the door may be preferred. No damage will be attendant to such closing of the door.

In any case, when the distal end portion 72 of the securing bolt 70 has reached the position shown in Fig. 3C, the seal 33 of the inner door 31 will have contacted the front surface 43 of the

housing 22. This, of course, terminates further forward movement of the securing bolt within the passage 129. The compression spring 149 causes the grasping segments 121 again to be returned to the first position 131. During such movement, the cam surface 114 forces the grasping segments, together until the lateral shoulder portions 133 of adjoining grasping segments seat against each other. This similarly causes the male screw threads 74 and the female screw threads 130 to seat in each other as shown in Fig. 3C. When this has occurred, the securing bolt is fully screw threadable in the female assembly 120 of the grasping assembly.

The operator then turns the handle portion 64 of the securing bolt assembly 60 about the longitudinal axis 71 of the securing bolt as necessary to achieve the desired compression, and thus seal, of the main seal 33 with the front surface 43 of the housing 22. Normally this requires only a portion of a turn about the longitudinal axis. It is possible, particularly if steady pressure is applied in closing the door, that no turning of the handle portion, and thereby the securing bolt, will be required to achieve the desired seal. However, normally a portion of a turn is applied if only to insure that the desired seal has been achieved.

Therefore, the fastening apparatus of the present invention has application to the rapid and dependable interconnection of work objects of a variety of types having particular utility in the closing and sealing of the main doors of vending machines and the like which affords the mechanical advantage necessary to achieve the optimum seal, but which can be operated in a small fraction of the time and with a small fraction of the effort required by conventional fastening mechanisms; which assists in assuring that the doors of vending machines when closed are sealed in the optimum manner; which minimizes the amount of waste of electrical energy, wearing of equipment and damage or inadequate refrigeration of vendables attendant to conventional operation; and which is durable, dependable and fully capable of operating as otherwise required, with a high degree of security.

Although the invention has been herein shown and described in what is conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of the invention, which is not to be limited to the illustrative details disclosed.

Claims

1. A fastening apparatus (10) operable to secure a pair of work objects (21, 22) to each other, the fastening apparatus (10) comprising:
 - an engagement member (70) having a longitudinal axis (71) and adapted to be mounted
2. The fastening apparatus of Claim 1 characterized in that the engagement member (70) has a distal end portion (72) about which are formed male screw threads (74), the passage (129) forms female screw threads (130) when the segments (121) are in the first position, and the compression spring (149) urges the female screw threads (130) into screw threadable engagement with the male screw heads (74) of the engagement member (70).
3. The fastening apparatus of Claims 1 or 2 characterized in that the engagement member (70) comprises a securing bolt.

on one work object (21) for substantially rotational movement about the longitudinal axis (71);

mounting means (80);

a housing (91) mounted on the mounting means (80), the housing (91) having an opening (112) and an internal chamber (113) within the housing (91), the chamber (113) being bounded by a cam surface (114) convergent in the direction of the opening (112);

at least two grasping segments (121) received in the chamber (113) of the housing (91), the segments (121) being positionable in a first position with the segments (121) transversely forming a closed substantially circular configuration and defining a passage (129) therethrough in substantial alignment with the opening (112) of the housing (91);

a spring (149) in the housing (91) in engagement with the segments (121);

characterized in that:

the spring (149) is a compression spring in the housing (91) and resiliently retains the segments (121) in the first position whereby when the one work object (21) is moved to a closed position, the engagement member (70) passes through the opening (112) and into the passage (129) formed by the segments (121) in the first position to force the segments (121) inwardly of the housing (91) from the first position and from each other along the cam surface (114) to penetrate the passage (129), the compression spring (149) urging the grasping segments (121) into engagement with the engagement member (70); and

the housing (91) further comprises a backwall (146) having a lip (148) extending inwardly of the housing (91), the lip (148) and backwall (146) extending inwardly of the housing (91) internally of the spring (149) to retain the spring (149) in position within the housing (91).

2. The fastening apparatus of Claim 1 characterized in that the engagement member (70) has a distal end portion (72) about which are formed male screw threads (74), the passage (129) forms female screw threads (130) when the segments (121) are in the first position, and the compression spring (149) urges the female screw threads (130) into screw threadable engagement with the male screw heads (74) of the engagement member (70).

3. The fastening apparatus of Claims 1 or 2 characterized in that the engagement member (70) comprises a securing bolt.

4. The fastening apparatus as claimed in Claims 2 or 3 characterized in that the distal end portion (72) of the engagement member (70) has a tapered probe (75) ending.
5. The fastening apparatus as claimed in any one of the preceding claims, characterized in that each grasping segment (121) has a ridge (125) on an outer surface thereof, the ridge (125) being received in a guide slot (115) located in the cam surface (114) of the housing (91).
6. The fastening apparatus as claimed in any one of the preceding claims characterized in that the mounting means (80) comprises a bracket (80) for mounting the housing (91) on its work object (22), the bracket (80) having at least one hole (85) therein adapted to be mounted on the object (22), the housing (91) having at least one projection (94) of sufficiently smaller diameter than the hole (85) of the bracket (80) so as to extend through the hole (85) and permit lateral movement of the housing (91) on the bracket (80).
7. The fastening apparatus as claimed in Claim 6 further characterized by attachment means (98) secured on the projection (94) to prevent the projection (94) from being drawn outwardly through the hole (85).
8. The fastening apparatus as claimed in any one of the preceding claims characterized by three grasping segments (121) received in the chamber (113), each segment (121) being transversely arcuate and having lateral shoulder portions (133), the grasping segments (121), when in the first position, forming a closed substantially circular configuration with the shoulder portions (133) of adjacent segments (121) being in juxtaposition to form the passage (129).
9. The fastening apparatus as claimed in any one of the preceding claims characterized in that the grasping segments (121) have outer surfaces convergent in the direction of the opening (112) and in juxtaposition to the cam surface (114) of the housing (91), and inner surfaces which in the first position match to form female screw threads (130) bounding the passage (129).
10. The fastening apparatus as claimed in any one of the preceding claims characterized in that the work objects (21, 22) comprise a closure (21) and a case (22).
11. The fastening apparatus as claimed in Claim 10 characterized in that the closure (21) and case (22) form part of a vending machine.
12. The fastening apparatus as claimed in any one of the preceding claims characterized in that the housing (91) further comprises a strike surface (110) deployed on the housing (91) on the opposite side of the opening (112) from the cam surface (114), the strike surface (110) converging upon the opening (112) in substantial alignment with the cam surface (114).
13. The fastening apparatus as claimed in Claim 12 characterized in that the strike surface (110), opening (112), chamber (113), and permitted lateral movement of the housing (91) permit the engagement member (70) and the grasping segments (121) to self align with each other.
14. A vending machine including a fastening apparatus (10) as claimed in any one of the preceding claims.

Patentansprüche

- Befestigungsvorrichtung (10) zur Befestigung eines Werkstückpaars (21, 22) aneinander, wobei die Befestigungsvorrichtung (10) folgendes umfaßt:
 - ein Eingriffselement (70) mit einer Längsachse (71), wobei das Element an einem Werkstück (21) so angebracht werden kann, daß es im wesentlichen um die Längsachse (71) drehbar ist;
 - eine Montageeinrichtung (80);
 - ein an der Montageeinrichtung (80) angebrachtes Gehäuse (91), wobei das Gehäuse (91) eine Öffnung (112) und eine Innenkammer (113) in dem Gehäuse (91) aufweist, wobei das Gehäuse (113) durch eine Nockenoberfläche (114) begrenzt ist, die in Richtung der Öffnung (112) zusammenläuft;
 - mindestens zwei Greifsegmente (121), die in der Kammer (113) des Gehäuses (91) aufgenommen werden, wobei die Segmente (121) an einer ersten Position positioniert werden können, wobei die Segmente (121) transversal eine geschlossene, im wesentlichen kreisförmige Konfiguration bilden und dort hindurch einen Durchgang (129) definieren, der sich im wesentlichen axial mit der Öffnung (112) des Gehäuses (91) ausgerichtet ist;
 - eine Feder (149) in dem Gehäuse (91), die sich im Eingriff mit den Segmenten (121) befindet;
 - dadurch gekennzeichnet, daß:

die Feder (149) eine Druckfeder in dem Gehäuse (91) darstellt, welche die Segmente (121) gefedert an der ersten Position hält, und wenn das eine Werkstück (21) an eine geschlossene Position bewegt wird, so tritt das Eingriffselement (70) durch die Öffnung (112) in den durch die Segmente (121) gestalteten Durchgang (129) an die erste Position, so daß die Segmente (121) aus der ersten Position und voneinander entlang der Nockenoberfläche (113) gedrückt werden, so daß sie in den Durchgang (129) eindringen, wobei die Druckfeder (149) die Greifelemente (121) in Eingriff mit dem Eingriffselement (70) drückt; und wobei

das Gehäuse (91) ferner eine Rückwand (146) mit einer Nase (148) umfaßt, die sich zu dem Gehäuse (91) einwärts erstreckt, wobei sich die Nase (148) und die Rückwand (146) innerhalb der Feder (149) einwärts zu dem Gehäuse (91) erstrecken, um die Feder (149) in dem Gehäuse (91) an der Verwendungsposition zu halten.

2. Befestigungsvorrichtung nach Anspruch 1, dadurch gekennzeichnet, daß das Eingriffselement (70) ein distales Endstück (72) aufweist, um das herum äußere Schraubengewinde (74) ausgebildet sind, wobei der Durchgang (129) innere Schraubengewinde (130) bildet, wenn sich die Segmente (121) an der ersten Position befinden, und wobei die Druckfeder (149) die inneren Schraubengewinde (130) in Gewindeeingriff mit den Schraubenköpfen (74) mit Außen Gewinde des Eingriffselement (70) drückt.
3. Befestigungsvorrichtung nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß das Eingriffselement (70) einen Sicherungsbolzen umfaßt.
4. Befestigungsvorrichtung nach Anspruch 2 oder 3, dadurch gekennzeichnet, daß das distale Endstück (72) des Eingriffselements (70) ein konisches Fühlerende (75) aufweist.
5. Befestigungsvorrichtung nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß jedes Greifsegment (121) an einer Außenoberfläche eine Rippe (125) aufweist, wobei die Rippe (125) in einem Führungsschlitz (115) aufgenommen wird, der sich in der Nockenoberfläche (114) des Gehäuses (91) befindet.
6. Befestigungsvorrichtung nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß die Montageeinrichtung (80) einen Träger (80) zur Befestigung des Gehäuses

5 (91) an dessen Werkstück (22) umfaßt, wobei der Träger (80), der darin mindestens ein Loch (85) aufweist, an dem Werkstück (22) angebracht werden kann, wobei das Gehäuse (91) mindestens einen Vorsprung (94) umfaßt, der einen ausreichend kleineren Durchmesser als das Loch (85) des Trägers (80) aufweist, so daß sich der Vorsprung durch das Loch (85) erstreckt und eine laterale Bewegung des Gehäuses (91) an dem Träger (80) zuläßt.

7. Befestigungsvorrichtung nach Anspruch 6, ferner gekennzeichnet durch eine Befestigungs einrichtung (98), die an dem Vorsprung (94) angebracht ist, um zu verhindern, daß der Vorsprung (94) auswärts durch das Loch (85) gezogen wird.
8. Befestigungsvorrichtung nach einem der vorstehenden Ansprüche, gekennzeichnet durch drei Greifsegmente (121), die in der Kammer (113) aufgenommen werden, wobei jedes Segment (121) transversal bogentörmig ist und laterale Ansatzteilstücke (133) aufweist, wobei die Greifsegmente (121) an der ersten Position eine geschlossene, im wesentlichen kreisförmige Konfiguration bilden, wobei sich die Ansatzteilstücke (133) der benachbarten Segmente (121) in Juxtaposition befinden, so daß sie den Durchgang (129) bilden.
9. Befestigungsvorrichtung nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß die Greifsegmente (121) Außenober flächen aufweisen, die in Richtung der Öffnung (112) konvergieren und die sich neben der Nockenoberfläche (114) des Gehäuses (91) befinden, und wobei die Greifsegmente Innen oberflächen aufweisen, die an der ersten Position so zusammenpassen, daß sie innere Schraubengewinde (130) bilden, welche den Durchgang (129) begrenzen.
10. Befestigungsvorrichtung nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß die Werkstücke (21, 22) einen Verschluß (21) und ein Gehäuse (22) umfassen.
11. Befestigungsvorrichtung nach Anspruch 10, dadurch gekennzeichnet, daß der Verschluß (21) und das Gehäuse (22) Teile eines Verkaufsautomaten darstellen.
12. Befestigungsvorrichtung nach einem der vorstehenden Ansprüche, dadurch gekennzeichnet, daß das Gehäuse (91) ferner eine Aufprall oberfläche (110) umfaßt, die sich an dem Gehäuse (91) an der entgegengesetzten Seite der

- Öffnung (112) von der Nockenoberfläche (114) erstreckt, wobei die Aufprallobertfläche auf der Öffnung (112) im wesentlichen axial mit der Nockenoberfläche (114) ausgerichtet zusammenläuft.
13. Befestigungsvorrichtung nach Anspruch 12, dadurch gekennzeichnet, daß es die Aufprallobertfläche (110), das Gehäuse (112), die Kammer (113) und die zulässige laterale Bewegung des Gehäuses (91) ermöglichen, daß sich das Eingriffselement (70) und die Greifsegmente (121) zueinander selbst ausrichten.
14. Verkaufsautomat mit einer Befestigungsvorrichtung (10) gemäß einem der vorstehenden Ansprüche.
- Revendications**
1. Appareil de fixation (10) fonctionnant pour attacher une paire d'objets de travail (21, 22) l'un à l'autre, l'appareil de fixation (10) comprenant :
- un élément d'accouplement (70) ayant un axe longitudinal (71) et adapté pour être monté sur un objet de travail (21) sensiblement en mouvement de rotation autour de l'axe longitudinal (71);
 - des moyens de montage (80);
 - un boîtier (91) monté sur les moyens de montage (80), le boîtier (91) ayant une ouverture (112) et une chambre intérieure (113) au sein du boîtier (91), la chambre (113) étant limitée par une surface de came (114) convergant en direction de l'ouverture (112);
 - au moins deux segments de serrage (121) reçus dans la chambre (113) du boîtier (91);
 - les segments (121) étant positionnables dans une première position où les segments (121) forment transversalement une configuration fermée sensiblement circulaire et définissent un passage (129) traversant sensiblement aligné avec l'ouverture (112) du boîtier (91);
 - un ressort (149) dans le boîtier (91) en contact avec les segments (121);
 - caractérisé en ce que :
 - le ressort (149) est un ressort de compression dans le boîtier (91) et retient de manière élastique des segments (121) dans la première position moyennant quoi quand le premier objet de travail (21) se déplace vers une position fermée, l'élément d'accouplement (70) passe à travers l'ouverture (112) et dans le passage (129) formé par les segments (121) dans la première position pour forcer les segments (121) vers l'intérieur du boîtier (91) en s'écartant de la première position et l'un de l'autre,
 - le long de la surface de came (114), pour pénétrer dans le passage (129), le ressort de compression (149) sollicitant les segments de serrage (121) en prise avec l'élément d'accouplement (70); et
 - le boîtier (91) comprend en outre une paroi arrière (146) ayant une lèvre (148) s'étendant vers l'intérieur du boîtier (91), la lèvre (148) et la paroi arrière (146) s'étendant vers l'intérieur du boîtier (91) intérieurement au ressort (149) pour retenir le ressort (149) en position au sein du boîtier (91).
2. Appareil de fixation selon la revendication 1, caractérisé en ce que l'élément d'accouplement (70) présente une partie d'extrémité distale (72) autour de laquelle sont formés des filets de vissage mâles (74), le passage (129) forme des filets de vissage femelles (130) quand les segments (121) sont dans la première position, et le ressort de compression (149) pousse le filet de vissage femelle (130) en contact de vissage avec les filets de vissage mâles (74) de l'élément d'accouplement (70).
3. Appareil de fixation selon les revendications 1 ou 2, caractérisé en ce que l'élément d'accouplement (70) comprend un boulon de sécurité.
4. Appareil de fixation selon les revendications 2 ou 3, caractérisé en ce que la partie d'extrémité distale (72) de l'élément d'accouplement (70) se termine en embout (75) conique.
5. Appareil de fixation selon l'une quelconque des revendications précédentes, caractérisé en ce que chaque segment de serrage (121) a une nervure (125) sur une de ses surfaces extérieures, la nervure (125) étant reçue dans une fente de guidage (115) située sur la surface de came (114) du boîtier (91).
6. Appareil de fixation selon l'une quelconque des revendications précédentes, caractérisé en ce que les moyens de montage (80) comprennent une console (80) pour monter le boîtier (91) sur son objet de travail (22), la console (80) ayant au moins un trou (85) à l'intérieur adapté pour être monté sur l'objet (22), le boîtier (91) ayant au moins une saillie (94) de diamètre suffisamment petit que le trou (85) de la console (80) pour s'étendre à travers le trou (85) et permettre le déplacement latéral du boîtier (91) sur la console (80).
7. Appareil de fixation selon la revendication 6, caractérisé en outre par des moyens de fixation (98) fixés sur la saillie (94) pour empêcher

la saillie (94) d'être tirée vers l'extérieur à travers le trou (85).

8. Appareil de fixation selon l'une quelconque des revendications précédentes, caractérisé par trois segments de serrage (121), reçus dans la chambre (113), chaque segment (121) étant transversalement arqué et ayant des parties d'épaulement latérales (133); les éléments de serrage (121) formant, lorsqu'ils sont dans la première position, une configuration fermée sensiblement circulaire dans laquelle les parties d'épaulement (133) des segments adjacents (121) sont juxtaposées pour former le passage (129). 5

9. Appareil de fixation selon l'une quelconque des revendications précédentes, caractérisé en ce que les segments de serrage (121) ont des surfaces extérieures convergeant dans la direction de l'ouverture (112) et juxtaposées à la surface de came (114) du boîtier (91), et des surfaces intérieures qui dans la première position sont appariées pour former les filets de vissage fermelles (130) limitant le passage (129). 10

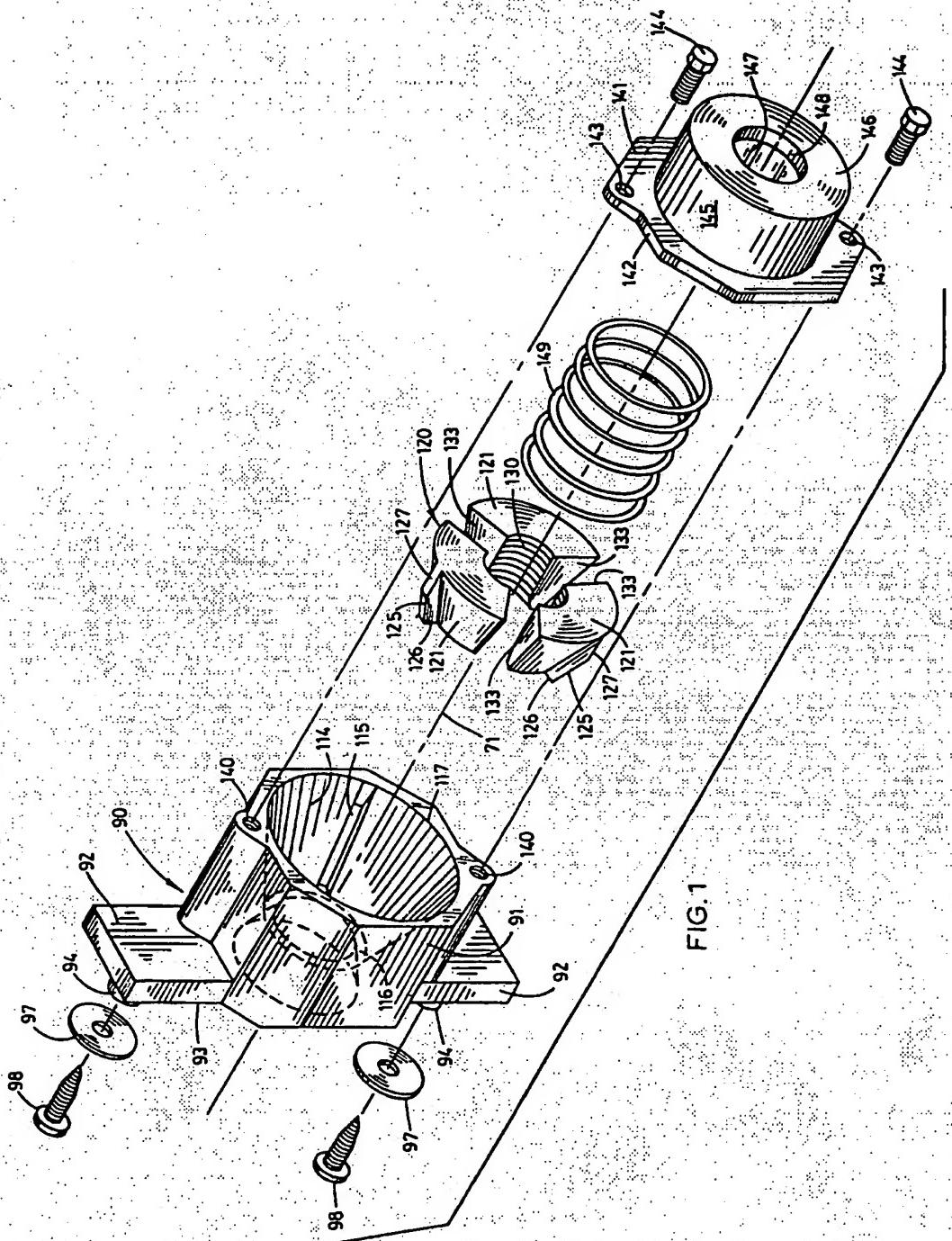
10. Appareil de fixation selon l'une quelconque des revendications précédentes, caractérisé en ce que les objets de travail (21, 22) comprennent une fermeture (21) et une caisse (22). 15

11. Appareil de fixation selon la revendication 10, caractérisé en ce que la fermeture (21) et la caisse (22) font partie d'une machine distributrice. 20

12. Appareil de fixation selon l'une quelconques des revendications précédentes, caractérisé en ce que le boîtier (91) comprend en outre une surface d'attaque (110) déployée sur le boîtier (91) du côté opposé à l'ouverture (112) à partir de la surface de came (114); la surface d'attaque (110) convergeant vers l'ouverture (112) sensiblement en alignement avec la surface de came (114). 25

13. Appareil de fixation selon la revendication 12, caractérisé en ce que la surface d'attaque (110), l'ouverture (112), la chambre (113), et le déplacement latéral autorisé du boîtier (91) permettent à l'élément d'accouplement (70) et aux segments de serrage (121) de s'auto-aligner les uns avec les autres. 30

14. Machine distributrice comprenant un appareil de fixation (10) selon l'une quelconque des revendications précédentes. 35



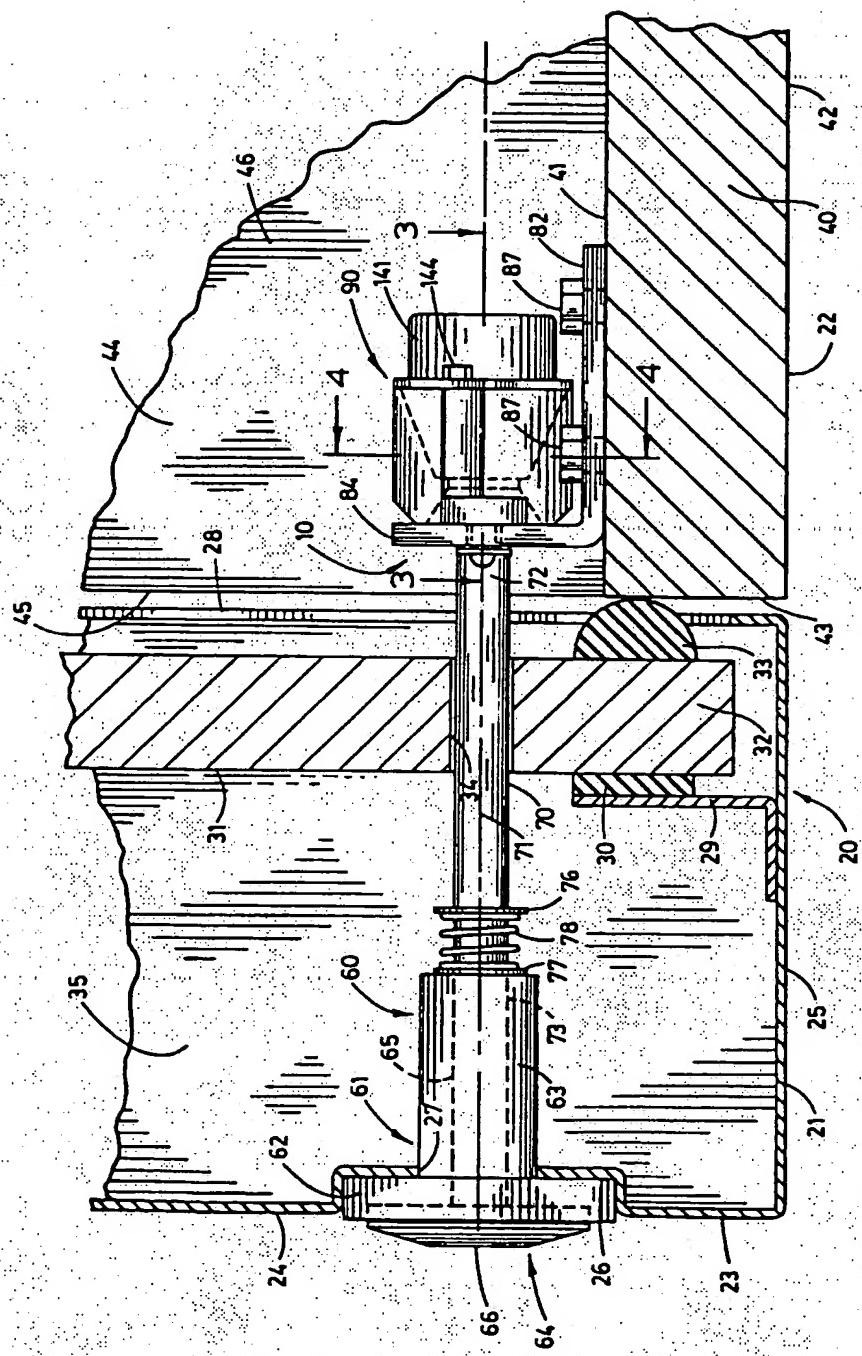


FIG. 2

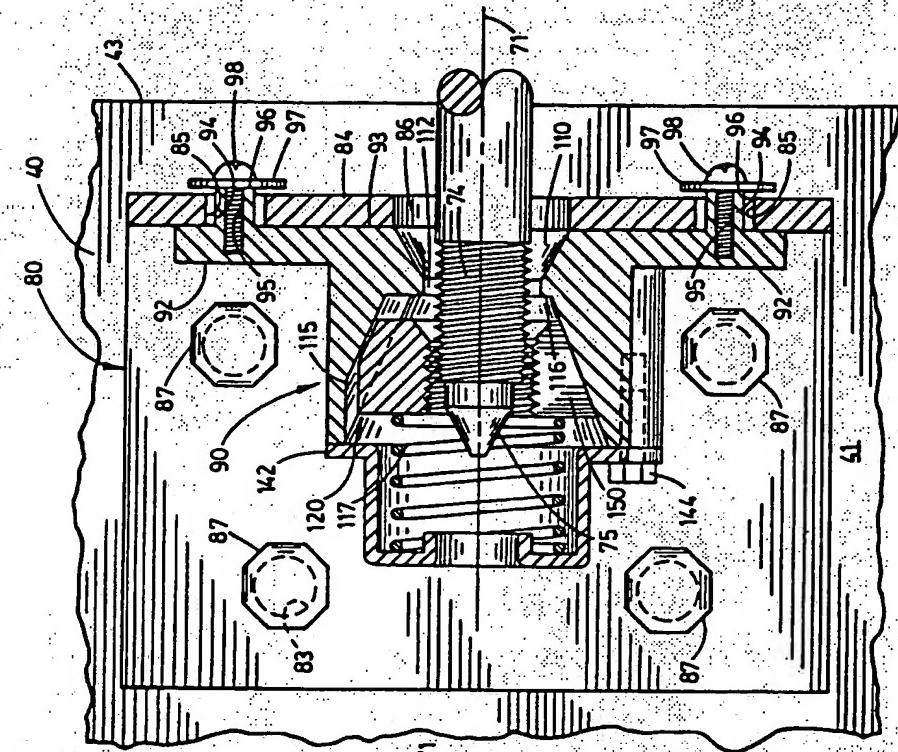


FIG. 3B

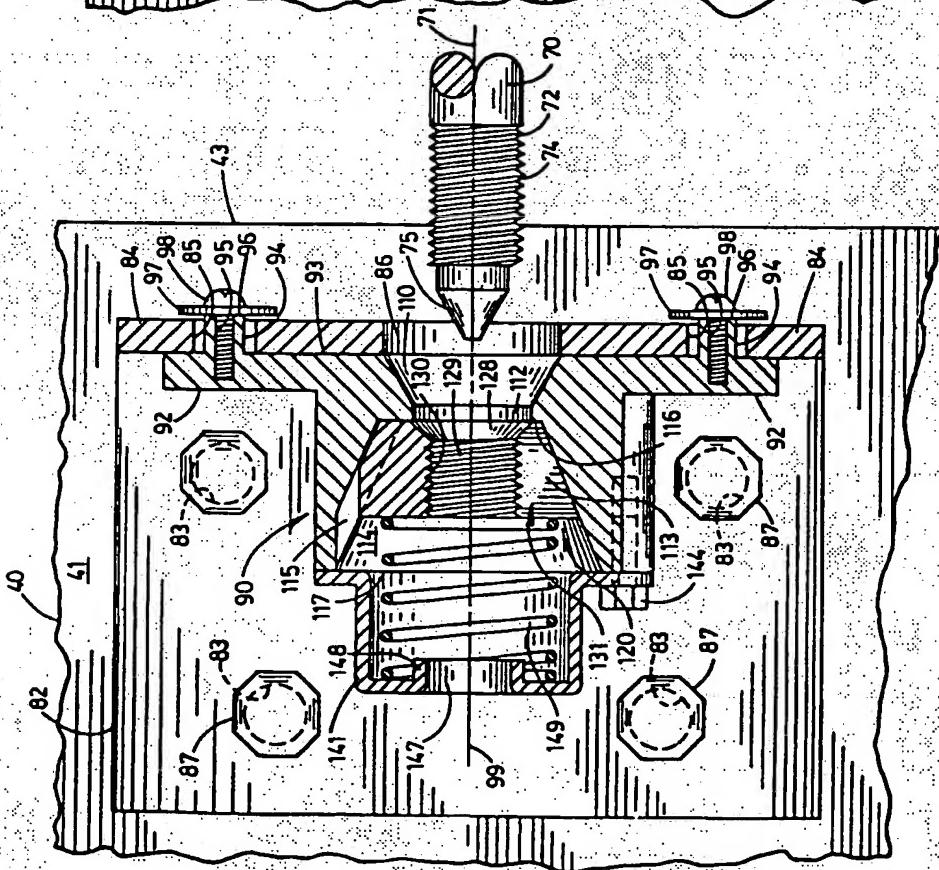


FIG. 3A

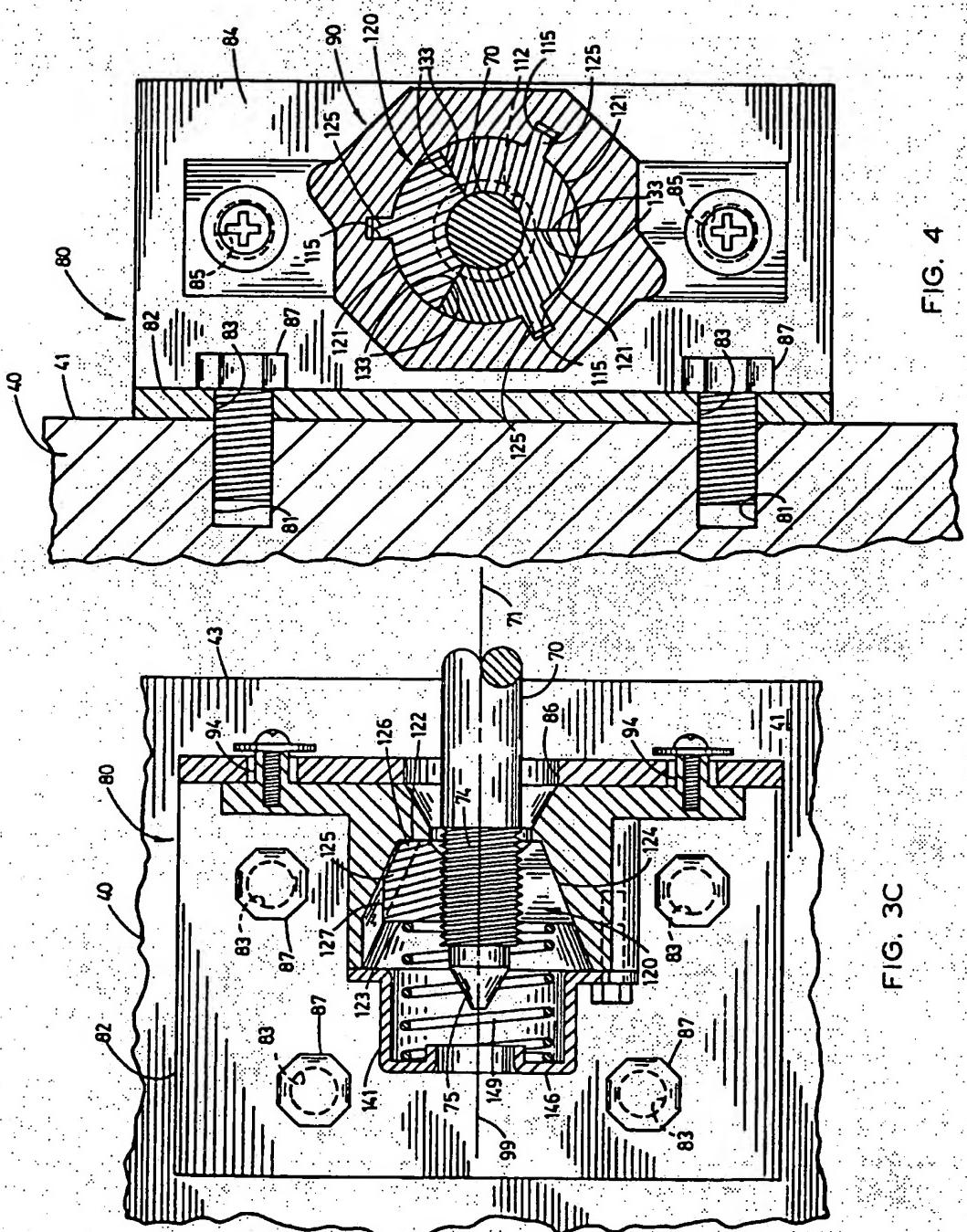


FIG. 4

FIG. 3C